

WHAT IS CLAIMED IS:

1 1. A method for generating a ring map for optical network applications,
2 the method comprising:
3 sending a first discovery message to a first node through a portion of an
4 optical network, the first node corresponding to a first node identification and a first
5 predetermined identification, the first discovery message including at least a source node
6 identification associated with a source node, a source predetermined identification associated
7 with the source node, and a first ring connectivity map;
8 processing at least information associated with the source node identification
9 and the first node identification;
10 if the source node identification and the first node identification are different,
11 updating the first ring connectivity map;
12 if the source node identification and the first node identification are identical,
13 processing at least information associated with the source
14 predetermined identification and the first predetermined identification;
15 if the source predetermined identification and the first predetermined
16 identification are different, sending a first alarm message indicating multiple assignments of
17 the source node identification.

1 2. The method of claim 1, and further comprising:
2 if the source node identification and the first node identification are identical
3 and if the source predetermined identification and the first predetermined identification are
4 identical, storing a first ring map including at least information associated with the first ring
5 connectivity map at the source node.

1 3. The method of claim 2, and further comprising:
2 sending a validation message to a second node for validating the first ring
3 map, the validation message including at least information associated with the first ring map.

1 4. The method of claim 1, and further comprising:
2 if the first node includes a second ring map,
3 processing at least information associated with the second ring map
4 and the source node identification;

5 if the source node identification is not present in the second ring map,
6 sending a first initialization message.

1 5. The method of claim 4, and further comprising:
2 if the first node includes the second ring map and if the source node
3 identification is absent from the second ring map, sending a second discovery message.

1 6. The method of claim 1 wherein the first node is the same as the source
2 node.

1 7. The method of claim 1 wherein the first node is different from the
2 source node.

1 8. The method of claim 1 wherein updating the first ring connectivity
2 map comprises adding the first node identification to the first ring connectivity map.

1 9. The method of claim 1, and further comprising:
2 if the source node identification and the first node identification are different,
3 increasing a number of nodes by one, the number of nodes stored in the first discovery
4 message.

1 10. The method of claim 1 wherein the first predetermined identification is
2 a first unique identification, and the source predetermined identification is a source unique
3 identification.

1 11. A method for validating a ring map for optical network applications,
2 the method comprising:
3 sending a first validation message from a source node through at least a
4 portion of an optical network, the source node associated with a first ring map, the first
5 validation message including at least a source node identification associated with the source
6 node and a first ring connectivity map associated with the source node, the first ring map
7 including at least information associated with the source node identification and the first ring
8 connectivity map;
9 receiving the first validation message at a first node directly from the source
10 node, the first node associated with a second ring map;

11 processing at least information associated with the source node identification
12 and the second ring map;
13 if the source node identification is not associated with a predetermined node,
14 sending a first initialization message;
15 if the source node identification is associated with the predetermined node,
16 processing at least information associated with the first ring map and
17 the second ring map;
18 if the first ring map and the second ring map are inconsistent, sending a
19 first alarm message.

1 12. The method of claim 11 wherein processing at least information
2 associated with the first ring map and the second ring map comprises:
3 determining whether the m th node identification in the first ring map is the
4 same as the $(m-1)$ th node identification or the $(m+1)$ th node identification in the second ring
5 map, m being an integer.

1 13. The method of claim 12 wherein processing at least information
2 associated with the first ring map and the second ring map further comprises:
3 if the source node identification is the second node identification in the second
4 ring map, determining whether the m th node identification in the first ring map is the same as
5 the $(m+1)$ th node identification in the second ring map;
6 if the source node identification is the last node identification in the second
7 ring map, determining whether the m th node identification in the first ring map is the same as
8 the $(m-1)$ th node identification in the second ring map.

1 14. The method of claim 11, and further comprising:
2 receiving a first discovery message at the source node, the first discovery
3 message including at least a second node identification associated with a second node;
4 processing at least information associated with the second node identification
5 and the first ring map;
6 if the second node identification is absent from the first ring map,
7 sending a second discovery message for generating a third ring map at
8 the source node;
9 sending a second initialization message.

1 15. The method of claim 11 wherein the first node is the nearest node to
2 the source node in a ring in a clockwise direction.

1 16. The method of claim 11 wherein the first node is the nearest node to
2 the source node in a ring in a counterclockwise direction.

1 17. The method of claim 11, and further comprising if the source node
2 identification is a node identification other than the second node identification or the last
3 node identification in the second ring map, sending a first discovery message for generating a
4 third ring map at the first node.

1 18. A method for processing a discovery message for optical network
2 applications, the method comprising:
3 sending a first discovery message to a first node through a portion of an
4 optical network, the first node associated with a first node identification and a first
5 predetermined identification, the first discovery message including at least a source node
6 identification associated with a source node, a source predetermined identification associated
7 with the source node, and a first ring connectivity map;
8 if the first node includes a second ring map,
9 processing at least information associated with the second ring map
10 and the source node identification;
11 if the source node identification is absent from the second ring map,
12 sending a first initialization message;
13 if the first node is free from the second ring map,
14 processing at least information associated with the source node
15 identification and the first node identification;
16 if the source node identification and the first node identification are
17 different, updating the first ring connectivity map and sending the first discovery message to
18 a second node;
19 if the source node identification and the first node identification are
20 identical,
21 processing at least information associated with the source
22 predetermined identification and the first predetermined identification;

23 if the source predetermined identification and the first
24 predetermined identification are different, sending a first alarm message indicating multiple
25 assignments of the source node identification.

1 19. The method of claim 18, and further comprising:
2 if the source node identification and the first node identification are identical
3 and if the source predetermined identification and the first predetermined identification are
4 identical, storing at least information associated with the first ring connectivity map at the
5 source node.

1 20. The method of claim 18 wherein updating the first ring connectivity
2 map comprises adding the first node identification to the first ring connectivity map.

1 21. The method of claim 18 wherein the first predetermined identification
2 is a first unique identification, and the source predetermined identification is a source unique
3 identification.

1 22. A method for processing a validation message for optical network
2 applications, the method comprising:
3 sending a first validation message from a source node through at least a
4 portion of an optical network, the source node associated with a first ring map, the first
5 validation message including at least a source node identification associated with the source
6 node and a first ring connectivity map associated with the source node, the first ring map
7 including at least information associated with the source node identification and the first ring
8 connectivity map;
9 receiving the first validation message at a first node directly from the source
10 node;
11 if the first node includes a second ring map;
12 processing at least information associated with the source node
13 identification and the second ring map;
14 if the source node identification is not associated with a predetermined
15 node, sending a first initialization message;
16 if the source node identification is associated with the predetermined
17 node,

18 processing at least information associated with the first ring
19 map and the second ring map;
20 if the first ring map and the second ring map are inconsistent,
21 sending a first alarm message.

1 23. The method of claim 22, and further comprising if the first node
2 includes the second ring map and if the source node identification is not associated with the
3 predetermined node, sending a first discovery message.

1 24 . An apparatus for generating a ring map for optical network
2 applications, the apparatus comprising:
3 a message receiver configured to receive a first discovery message, the first
4 discovery message including at least a first node identification associated with a first node, a
5 first predetermined identification associated with the first node, and a first ring connectivity
6 map;
7 a message sender configured to send an alarm message and send a second
8 discovery message, the second discovery message including at least a second node
9 identification associated with a second node, a second predetermined identification associated
10 with the second node, and a second ring connectivity map;
11 a memory system configured to store at least information associated with a
12 ring map;
13 a processing system coupled to the message receiver, the message sender, and
14 the memory system and associated with a third node identification and a third predetermined
15 identification;
16 wherein the processing system is configured to
17 process at least information associated with the first node identification
18 and the third node identification;
19 if the first node identification and the third node identification are
20 different, update the first ring connectivity map;
21 if the first node identification and the third node identification are
22 identical,
23 processing at least information associated with the first
24 predetermined identification and the third predetermined identification;

25 if the first predetermined identification and the third
26 predetermined identification are different, instruct the message sender to send the alarm
27 message indicating multiple assignments of the first node identification.

1 25. The system of claim 24 wherein the second ring connectivity map is
2 the updated first ring connectivity map.

1 26. The system of claim 25 wherein the second node identification is the
2 same as the first node identification, and the second predetermined identification is the same
3 as the first predetermined identification.

1 27. The apparatus of claim 24 wherein the processing system is further
2 configured to store the ring map in the memory system if the first node identification and the
3 third node identification are identical and if the first predetermined identification and the
4 third predetermined identification are identical, the ring map including information associated
5 with the first ring connectivity map and the first node identification.

1 28. An apparatus for validating a ring map for optical network
2 applications, the apparatus comprising:

3 a message receiver configured to receive a first validation message, the first
4 validation message including at least a first node identification associated with a first node
5 and a first ring connectivity map associated with the first node, the first validation message
6 associated with a first ring map including at least information associated with the first node
7 identification and the first ring connectivity map;

8 a message sender configured to

9 send an initialization message;

10 send an alarm message;

11 send a second validation message, the second validation message

12 including at least a second node identification associated with a second node and a second
13 ring connectivity map associated with the second node, the second validation message

14 associated with a second ring map including at least information associated with the second
15 node identification and the second ring connectivity map;

16 a memory system configured to store at least information associated with the
17 second ring map;

18 a processing system coupled to the message receiver, the message sender, and
19 the memory system and associated with the second node identification and the second
20 predetermined identification;
21 wherein the processing system is configured to
22 process at least information associated with the first node identification
23 and the second ring map;
24 if the first node identification is not associated with a predetermined
25 node, send the initialization message;
26 if the first node identification is associated with the predetermined
27 node,
28 process at least information associated with the first ring map
29 and the second ring map;
30 if the first ring map and the second ring map are inconsistent,
31 instruct the message sender to send the alarm message.

1 29. The apparatus of claim 28 wherein the predetermined node is one of
2 the two nodes nearest to a second node associated with the second node identification and the
3 second predetermined identification.